

MOBILE SIMPLE PAYMENT SYSTEM DEVELOPMENT FOR ONLINE DONATION INVIGORATION

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ABSTRACT

The simple payment service is becoming generalized as a payment and settlement means, covering consumers' online shopping, banking/financing, payment, remittance, and transfer, due to IT development and the FinTech industry's expansion. Due to changes in the payment means environment, donation or diverse donation activities started to become digitalized by adopting simple payment platforms. This study presents the mobile simple payment system construction strategy formed by the Korean Red Cross (KRC) and its execution method and results. This study aims to specifically present how online donation invigoration needs to be led and how the simple payment system can be used by non-governmental organizations (NGOs) and the relevant institutions that need to encourage contributions and donation activities according to change of the temporal environment. As a result of the case study, the mobile notice authentication and simple payment use rates of the elderly were very low. If an online system had been used for donation like other digital services, this study found that an increase in education for e-literacy in smartphones and services concerning the elderly is essential. Also, it was found that there is a need to consider IT companies' diverse technology types and open collaboration types on the access modes.

Key words: Mobile simple payment, Online donation, Digital service, Korean red cross.

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1. INTRODUCTION

As online to offline (O2O) industries recently become vitalized in various fields, the FinTech industry based on banking/finance and ICT has brought a new paradigm. This changes the demand for financial and administrative services, as various information systems are constructed due to ICT development. The FinTech industry can be divided into the remittance

field, payment field, and investment field, and the core of the FinTech industry refers to service through which users can more conveniently access financial service, safely pay and remit. One of the new FinTech features, including the simple payment service, is that its key factor is technology [1]. Namely, FinTech provides financial services in diverse ways by combining mobile devices, big data, and social media. The mobile simple payment service, above all, is a crucial function of FinTech in the payment and remittance fields [2].

Currently, the types of companies releasing the service include social platforms, portal sites, mobile communication carriers, banks, credit card companies, payment gateway (PG) companies, and social commerce companies. For payment service technology, there are financial over-the-top (OTT) and P2P. The mobile simple payment service market advances the generalization of financial transactions by the non-financial sector's active participation, in addition to the existing financial sector. According to Gartner, a market research company, the mobile payment market size was USD 240 billion, USD 330 billion, USD 450 billion, USD 620 billion, USD 780 billion (25.8% increase year on year), USD 930 billion, and USD 1.8 trillion (9.3%) in 2019. And they predicted that 10% would grow on an annual average by 2023 [3].

Representative simple payment services abroad include U.S. PayPal, Amazon Pay, Apple Pay, Chinese Alipay, and FinTech. In Korea, various types exist, such as IT platform company services like NAVER Pay, Kakao Pay, cellphone manufacturers' service including Samsung Pay, and credit cards and bank app cards [4]. The simple payment market is growing fast due to the dissemination of smartphones, ease of regulations, and companies' active participation in the market in many countries worldwide [5]. The simple payment service has placed itself in consumers' financial lives in combination with various technologies and supplementary services, and the market is continuously growing. In particular, the simple payment service has been popularized and is developing as a payment and financial transaction mode for everyday life. Therefore, it is now commonly used publicly in payment and settlement, including online shopping, financial payment, remittance, or account transfer [6]. Due to the financial payment's environmental change in everyday life, simple payment platforms have been adopted for contributions or diverse donation activities, so they have become digitalized. As global distribution market payment systems became online thanks to the development of FinTech, donation activities are also developing based on mobile simple payment services [7].

This study presents a successful case of a mobile simple payment system of Korea's typical public welfare institution, the Korean Red Cross (KRC), to pay donations. Through the study, the KRC's mobile simple payment system construction mode and success factor analysis results are presented. The system was developed to enhance the convenience of consumers accustomed to digital financial activities, centered on smartphones and IT devices, beyond the traditional GIRO method and mail payment method and encourage donation activities. Based on the analysis results, this study aims to present concrete implications on the digital system adoption and promotion method of the public institutions encouraging contributions and donations for public welfare.

2. RELATED SITUATION AND STATUS

2.1. Expansion of Simple Payment System

Simple payment service is an activity to pay using wireless devices such as a cellphone or tablet PC. The service means a method through which a user's payment information, including credit card, is registered with an electronic device, including a mobile device, and payment is carried out with simple authentication. The users can quickly and conveniently pay online or offline using various components such as password, pattern, and bio authentication like finger recognition without cash or an actual credit card [8].

The simple payment service started to spread in full swing after large U.S. online transaction site e-Bay provided simple (uncomplicated) payment and remittance service through PayPal in 1999. The service more explosively diffused in China than in the U.S., the pioneer of the simple payment service, which was derived from financial infrastructure differences in both countries. Chinese simple payment service market size (based on transaction amount) was CNY 58.8 trillion and CNY 98.7 trillion in 2016 and 2017, each, and the market size was about 80-fold more significant than the U.S. market. PayPal enhanced user convenience by making purchases and remittances possible with users entering simple passwords after initially registering credit card information [9].

Mobile simple payment system refers to pay using a mobile device instead of cash or a plastic card when a user purchases goods or services on/offline [10]. As offline payment methods, there is the Near Field Communication (NFC), a payment method through wireless communication, Magnetic Secure Transmission (MST), a technology that designed magnetic field to be generated with an act of near-contact of a mobile device, and app card method by which the bar code displayed inside an app is presented to the member store staff [11]. Online simple payment is a method to connect to a user's account or credit card once. The simple online payment is divided into pre-paid simple payment, USIM IC chip storage simple payment, and app-storage simple payment systems depending on countries and IT platform companies [12]. The mobile simple payment system means a user installs a simple payment app on a mobile device, enters the payment information of his/her credit card or bank account, and then payment is made through the mobile app upon payment [13].

According to a report released by BI intelligence operated by Business Insider, an IT media, the U.S. mobile payment size is predicted to grow 172% on an annual average by 2019 for five years. BI Intelligence predicted that Android system services such as Google Wallet would grow together, as Apple Pay is successful in the initial stages. According to China's Ministry of Finance and Economy, the size of e-Commerce in 2010 rose three-fold more from CNY 4.5 trillion) in 2010 to CNY 13.4 trillion in 2014. It is growing 30% each year, and it is forecast to exceed CNY 15 trillion this year. The ratio of e-Commerce in retail sales sharply increased from 0.1% in 2004 to 8.0% in 2013 [14].

2.2. Online Donation Activities

Donation is defined as giving one's own money or time resource, without reward, for social, charitable work, or public services [15]. Donation offers various types of support to beneficiaries ranging from the socially underprivileged to cultural and educational services. Donors obtain positive results such as satisfaction with themselves, self-efficiency, honor, and social status increase through donation activities. From this perspective, donation activities can be a critical yardstick for socially and individually deciding social welfare [16].

Although the role of the government has become gradually essential in relation to national social welfare, there are limitations for the government to meet the diverse needs of its social members. The participation and role of the private sector, including nonprofit organizations with regard to the common good, is essential to gradually meet the surging demand for welfare. Nonprofit organizations aiming to increase people's social welfare and the common good replenish most financial resources with donations required for service purposes contributed by individuals and corporations. Therefore, a donation culture needs to be invigorated as nonprofit organizations' social role and should be smoothly carried out [17].

Donation activities, in general, have developed from donation in cash to donation through GIRO. For example, World Vision, Good Neighbors, Food for the Hungry, and Save the Children, which are private NGOs, have invigorated regular sponsorship through overseas one-on-one support projects since 2000 [18]. The basis of regular sponsorship that could be

invigorated in the 2000s was digital marketing through high-speed Internet and the adoption of cash management service (CMS). Transparency of donation was enhanced through GIRO, and the convenience of donation payment through GIRO was elevated. Technological advances promoted the diversification of donation payment methods such as virtual accounts, QR codes, and convenient payment method printing [19].

However, fund-raising through GIRO is becoming an old-style method for raising cash due to the government's paperless policy, reinforcement of the Privacy Protection Act, and turning away of young generations. Due to the environmental change, NGOs are adopting blockchain fund-raising platforms to ensure transparency in donation-raising and execution [20]. NGOs have developed a new market of participatory donation culture through a smartphone app disseminated in 2012. Since 2012, the typical app for mobile donation apps is Big Walk. Big Walk was founded in 2011 and has grown into a participatory donation app. If a user executes the app, KRW 1 per 10 meters in donation supported by companies is raised based on GPS. This is a participatory fund-raising program in which users deliver donations raised through the app to NGOs [21]. In 2021, as the virtual space technology develops due to COVID-19, a change in donation culture is forecast to be made. Methods to donate in the metaverse world, a virtual space, will be devised [22] [23].

3. SYSTEM DEVELOPMENT

3.1. Development Background and Strategy

The Korean Red Cross (KRC) has created the social value of constructing Korean volunteer work organizations nationwide through public medical service, disaster relief, South-North Korea exchanges, and volunteer work organizations and operations since its foundation in 1905. Through the All People Fund-raising Campaign in 1949 for fund-raising culture, KRC strengthened Korea's donation culture. By changing the KRC membership fee into payment through GIRO from 2000, KRC led donation transparency and donation receipt issuance. However, the KRC membership fee shows a downtrend after reaching its peak at KRW 50.7 billion in 2016. The main reason is an anachronical fund-raising method. Other fund-raising organizations have applied diverse methods by which citizens can more easily participate in a donation based on technological development. KRC, however, is depending on deposits without a bankbook (cash) and payment through GIRO. The donation method through GIRO has not led to voluntary donation-participatory culture from young generations.

An institutional foundation was laid for mobile e-notice as a digital government innovation plan released by the Korean government on October 29, 2019. The Korean government plans to construct a pan-governmental digital notice project by 2022 and expand it to the private sector by 2023. If the current GIRO notice is shifted into an e-notice to the public sector, the government will save KRW 100 billion of postage cost. The government announced an effect of enhancing administrative efficiency and citizens' convenience as well. The government aims to construct a common digital notice and receipt-based app and form a mobile-focused digital one-stop service.

KRC sends a donation guide through GIRO to raise KRC membership fees to 18 million homes each year. Based on 2020, the raised amount of KRC was KRW 226.9 billion. KRC raised KRW 151.7 billion of money and other articles donations (including COVID-19 donations), KRW 31.4 billion sponsorship membership fee, and KRW 43.7 billion KRC membership fee. The donation money and other articles are primarily deposited without a bankbook (CSR and disaster donations). Excluding the unique situation of COVID-19, in 2020, KRW 30 billion or so of donation money and other articles are raised each year. As for the sponsorship membership fee, CMS took up 87%, payment through credit card 10.5%, and mobile simple payment 0.47% as a method donating a certain amount of money each month. When looking at KRC member fee payment methods, cash

(deposit without a bankbook) accounted for 24.39%, a donation through GIRO 43.34%, donation via virtual account 31.5%, and mobile simple payment 0.46%.

If the KRC membership fee is executed with mobile e-notice, more than KRW 3 billion of the postage cost and GIRO manufacturing cost can be reduced annually. Therefore, KRC, as a public institution, sought to construct a pan-government mobile e-notice and donation system. The Salvation Army's charity pot, visible on many streets in December yearly, has shifted into the digital pot by adopting an offline mobile simple payment system. KRC plans to establish a new donation culture, a mobile e-notice using the mobile simple payment to cope with change in the mobile environment. The pilot mobile e-notice system was carried out from March 25 to May 8, 2021, while KRC gradually shifted GIRO to mobile e-notice from 2023 (see figure1).

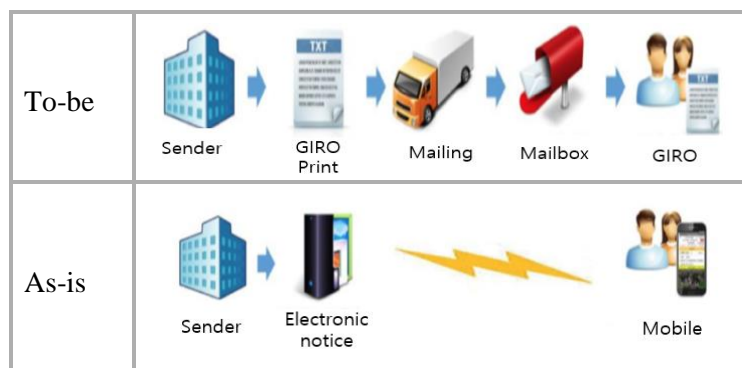


Figure 1 Mobile Simple Payment Method

3.2. Simple Payment System Development

KRC's purpose of sponsorship donation mobile simple payment is to expand donations by improving convenience and accessibility for donors using a private company's mobile simple payment systems. Concerning the construction process, a mobile notice is sent to citizens through text messages or push messages from public institutions, and they carry out their identity authentication through Kakao Pay, NAVER Pay, or KT Service. After identifying authentication, citizens receive various tax imposition or guide with mobile e-notice and can pay conveniently. For the actual execution system, the donor's cellphone number is an essential item.

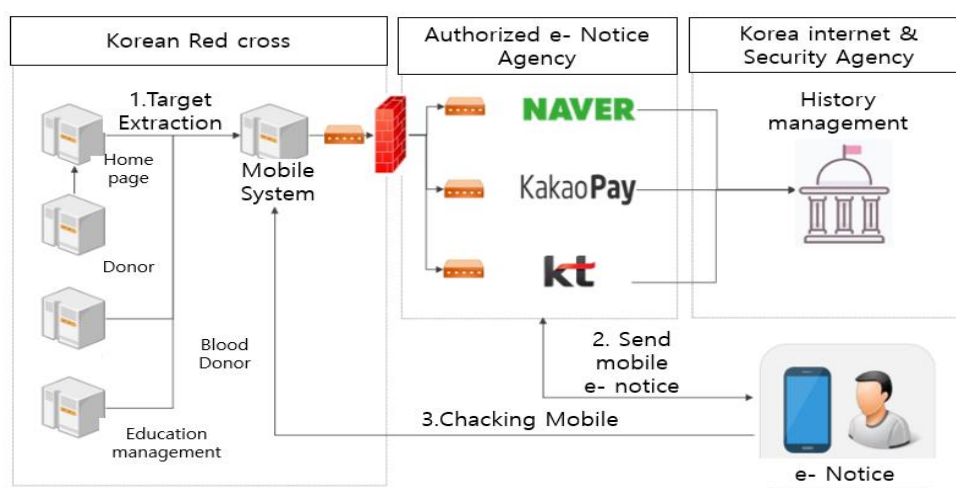


Figure 2 Mobile E-Notice Process

The KRC secured the legal basis of the mobile e-notice and simple payment system under the 2020 Government Mobile E-Notice Special Case Regulation. It is to shift the KRC-

possessing identification number into connecting information and match it with connecting information possessed by official e-document intermediaries (Kakao Pay, NAVER Pay, Payco, KT). KRC constructed a system sending mobile e-notices targeting the connecting information of members matched between KRC and the intermediaries (see figure 2).

The mobile simple payment system is a method through the mobile method from the existing GIRO method. With the execution of the mobile simple payment, effects of work simplification, postage cost savings, and eco-friendliness by shifting paper notice into e-notice can be created. The mobile e-notice system sends a donation guide (notice) through a mobile system with such functions as notification talk, text message, and PUSH through private companies (official e-notice intermediaries). When the donation guide arrives, a subject carries out his/her identity authentication using the mobile simple payment system. Because of e-notice features, one's identify authentication step is an essential factor. If the subject's identity is authenticated, the subject checks the mobile e-notice details and implements donation immediately using the simple payment system. The subject can check the status of donation through blockchain technology after he/she donated. The procedure has enhanced the transparency of donation. Also, the subject can check whether the mobile simple payment was accurately conducted through circulation certification (see figure 3).

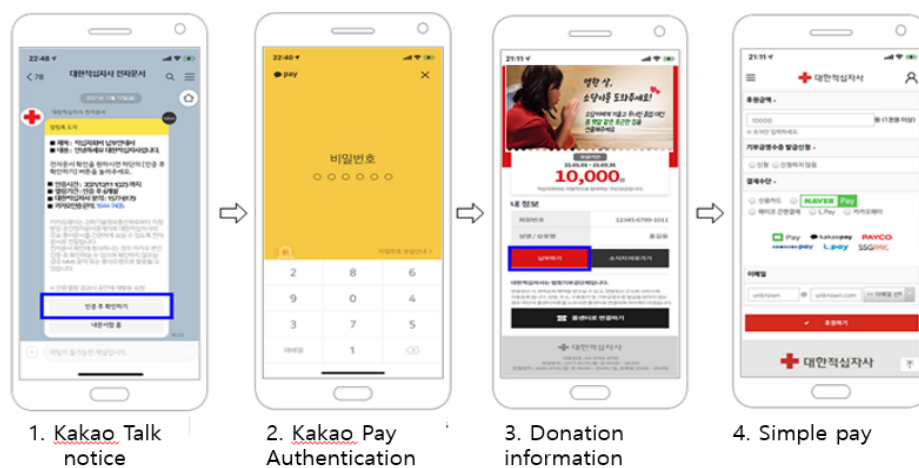


Figure 3 Mobile Screens of Pilot Mobile Simple Payment Execution

The four companies, designated as partner firms, have further notice and payment system features. KRC plays a role in delivering information on the e-notice, and the process of e-notice and payment reflects each intermediary's system features. NAVER Pay is a Web-based service where synergy can be promoted, as well as PR, through the Web. NAVER Pay's primary customers are members aged 40-59, and the payment cost is imposed upon authentication. A NAVER app must be installed. Mobile-based Kakao Pay has the most considerable advantage of providing notification talk through KakaoTalk.

The payment cost is imposed two times when the notice is sent, and authentication is carried out. An app must be installed. Payco's payment cost is imposed once when authentication is carried out like NAVER Pay. Paycoin app must be installed as well. KT has a system sending an e-notice through a mobile text message. For KT's e-notice, an app does not need to be installed, which can be an advantage. However, it may be misunderstood as phishing because the mobile e-notice is delivered with the link, which is a disadvantage. The payment cost is the highest compared to the three other companies, and the cost is imposed at once.

The pilot mobile e-notice was performed with 1.8 million subjects out of 5 million donor data that the KRC has. Regarding age, people in their 20s were 20,000, while people in their

30s were 180,000. People in their 40s, 50, 60s, 70s, and 80s were 260,000, 400,000, 410,000, 430,000, and 14 people, respectively. The server for sending was temporarily installed for the pilot execution, and Kakao Pay was selected as an official intermediary. Kakao Pay was selected because Kakao Pay is the oldest open e-document intermediary alongside KT, and all age groups are members of it. Therefore, it is easy to analyze characteristics by each age group. Upon payment, it was connected to the payment Web site of the KRC(see figure 4).

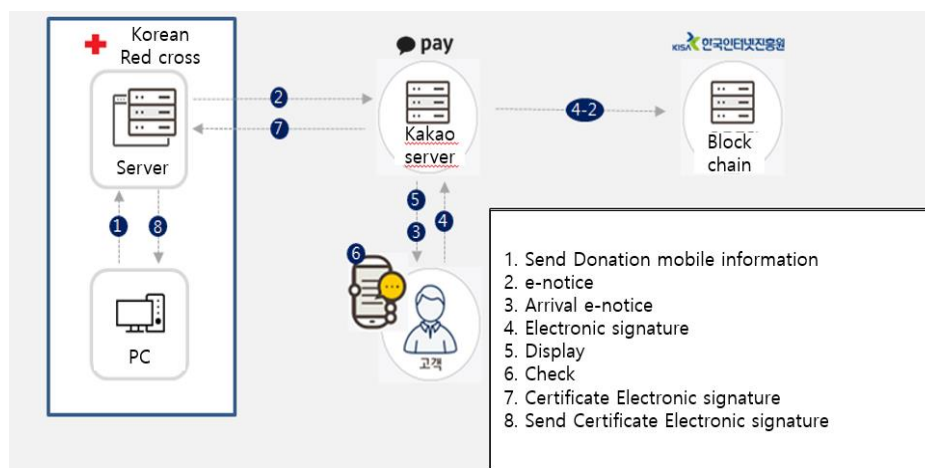


Figure 4 Pilot Execution Process of Mobile Simple Payment

To analyze the payment method, Kakao Pay, NAVER Pay, Payco, L-Pay, and card payment, ARS, small amount payment via cellphone, and virtual account methods were provided for the payment service. The notice duration was seven days, from March 25 to March 26, 2021, for the first notice and from April 5 to April 9, 2021, for the second notice. The mobile e-notice reading period and payment period were set by May 8, 2021, 30 days after receiving the notice. The donation amount was fixed at KRW 10,000. The entire mobile e-notice system will be constructed in November 2021. If the system is constructed, the NAVER Pay, Payco, KT, and Kakao Pay, which are official e-document intermediaries, can be used.

3.3. Platform Application Result

According to the pilot application result, 610,00 subjects of 1.8 million data that KRC has matched with the members of Kakao Pay. Those who carried out identity authentication through Kakao Pay were 19,868 people, and actually, those who donated were 2,046 people. The pilot application cost was KRW 21 million, and the donations were KRW 20.4 million. In detail, KRW 18 million was from mobile simple payment, KRW 2.45 million from ARS, and other payment methods recorded KRW 0. Those who provided their cellphone number to the KRC were 1,959.

After sending the mobile e-notice, the authentication rate was as follows: 5.95%, 5.15%, 3.4%, 2.65%, and 1.55% in the 20s, 30s, 40s, 50s, and 60s categories, respectively. Concerning the number of authentication, people in their 30s and 40s registered about six thousand, those in their 50s 4,700, and those in their 20s and 60s slightly over 1,000. The overall authentication rate was 3.1%. The donation rate vs. authentication was 9.15%. When looking at donation rate to authentication by generation, it was 5.65% for those in their 20s, 7.05% for those in their 30s, 11.5% for those in their 40s, 9.95% for those in their 50s, and 0.45% for those in their 60s. Specifically, the donation rate through the mobile e-notice was higher for those in their 40s to 60s.

The same conclusion as the general conclusion that the middle-aged people, having an economic sense of stability, donate much was drawn. What is peculiar is that those who were

in their 60s donated the most after authentication. It means that the possibility of paying the KRC membership fee is high because it is beyond an entry barrier of mobile e-notice (authentication). Regarding authentication rate by region, it was 3.2%, and regions showed no difference. As for donation paying people after authentication, the ratio was higher in small and medium-sized cities than in Seoul Metropolitan Area and metropolitan cities.

According to an analysis result of member matching, the matching rate between Kakao Pay and other public institutions was 60% on average, and the rate with the KRC was 33.7%. From this, it may be inferred that people in their 50s and over had more than 80% out of the data that the KRC had and that many people did not join the Kakao Pay (mobile simple payment). Concerning matching rate by generation, people in their 20s showed 82.9%, 30s 81.4%, 40s 66.0%, 50s 42.2%, 60s 18.7%, and 70s and over 4.4%. From the 60s and over group, the member matching rate was quite low. Out of 940,000 data among people aged 60 and over, 840,000 data did not match. As for gender, men's matching rate in their 20s and 30s was slightly higher than women's, and women's matching rate was higher from the 40s to 60s group. After the middle-age, women use the mobile simple payment more than men.

As for payment methods, mobile simple payment exceeded 70%, and payment with credit cards took up 29%. Nobody used the virtual account and small amount payment with the cellphone. A conclusion was drawn that people accustomed to mobile simple payment do not adopt a new method such as virtual account or small amount payment with a cellphone. Payment with credit card was 17%-32%, and it was evenly distributed over all age groups. The credit card use ratio was 27%-32% from the 30s to the 70s groups. However, the credit use rate was lower in the 20s group than the other age groups at 17.7%.

The payment using a credit card was similarly used in all age groups, although they joined the mobile simple payment system. As for the mobile simple payment system, Kakao Pay was 48.9%, NAVER Pay 19.3%, Payco 2.0%, and L-Pay 0.4%. Kakao Pay was higher than other mobile simple payment platforms because Kakao Pay was selected as the official e-document intermediary. As for the payment using Kakao Pay, people in their 40s, 50s, and 30s were the highest in the order, and the payment using NAVER Pay was the highest in the order of 40s, 30s, and 50s. It was difficult to analyze significant results for Payco and L Pay, as the number of donors was small.

Consequently, people in their 40s-50s used much Kakao Pay, and NAVER Pay was the platform used frequently by the 30s-40s groups. It was revealed that one person dually joined the mobile simple payment services. The reason is that 21% did not use the Kakao Pay payment system among those who used the simple payment system; that is, one out of three dually joined the mobile simple payment service (see table 1).

Table 1 Current Status of Payment Methods for Pilot Execution of Mobile Simple Payment

Classification		20s	30s	40s	50s	60s	70s
Total		1,801	62	436	694	474	116
Credit Card (Number,%)		530(29.4)	11(17.7)	122(27.9)	204(29.3)	153(32.2)	34(29.3)
Platform	Sub-total	1,271(70.6)	51(82.3)	314(72.0)	490(70.6)	321(67.7)	82(70.7)
	Kakao Pay	880(48.9)	36(2.0)	205(11.4)	328(18.2)	244(3.9)	57(1.3)
	NAVER Pay	347(19.3)	13(0.7)	90(5.0)	147(8.2)	71(3.9)	23(1.3)
	Payco	36(2.0)	2(0.1)	17(0.9)	12(0.7)	4(0.2)	1(0.1)
	L-Pay	8(0.4)	-	2(0.1)	3(0.2)	2(0.1)	1(0.1)

When looking at donation situation by date, donations plunged after the day when the e-notice was made. Only one person donated in nine days after March 26, when the first notice was over. During one month when the second notice was over after April 9 until May 8, the donation was made, but the number of donors remarkably fell (see figure 5).

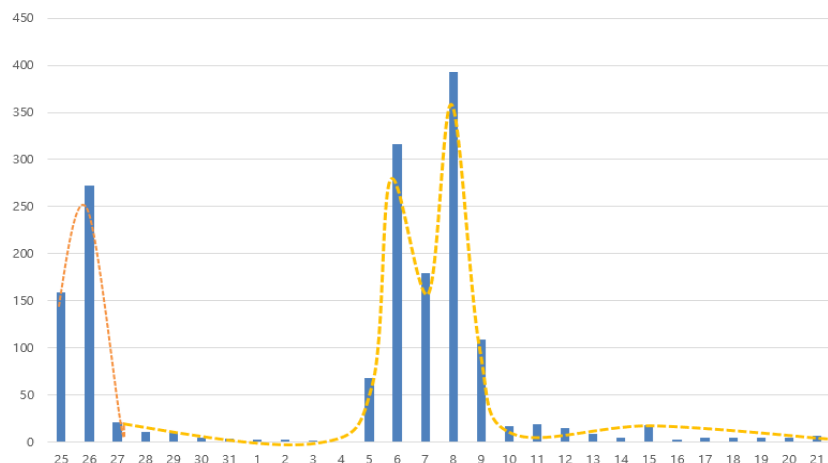


Figure 5 Current Status of Fund-Raising by Date of the Pilot Mobile e-Payment Execution

4. CONCLUSION

This study performed a pilot mobile payment system before the full pan-government digital notice and receipt project execution. The donation payment system through mobile e-notice was attempted by the Korean Red Cross (KRC) for the first time in Korea. Three points to discuss were found in the pilot execution; First, education for membership to and how to use the mobile simple payment system for people aged 60 and over should be a precondition to accepting the new technology of mobile simple payment, as the case study result showed. As seen from the cases of KRC, the ratio of mobile simple payment membership by the generation of people aged 60 and over was 10.3%, remarkably lower than 30%, the average membership ratio. Namely, the mobile simple payment membership ratio of the 20s group was 92%, so nine out of 10 joined, but only one out of 10 joined in the 60s and over group. Among the KRC membership fee donors, the mobile simply payment system, whose advantage is convenience and simplicity, instead became a donation barrier, given that people in their 60s and over took 51.6%.

Second, it is vital to manage the process where e-notice authentication rate improvement is preceded before executing the mobile simple payment system. If any subject does not conduct his/her identity authentication with the official e-document intermediary service, they do not go to the payment menu window, although the mobile e-notice is sent. To elevate the authentication rate, reliability towards the donation institutions should be higher. As for the mobile e-notice, if a subject reads the text message guide and he/she authenticates his/her identity, the donation menu image is displayed at the payment menu window. Because the subject decides whether to donate from the short guide text message, the reliability towards the institution is the most important. As seen in the case of KRC, the donors through mobile e-notice were the highest in the order of people in their 60s, 50s, 40s, 30s, and 20s. The result is similar to the existing KRC membership fee payment rate. As age becomes older, reliability towards KRC is higher.

This case study presented implications for constructing a pan-government digital platform through the pilot mobile simple payment system before performing a complete mobile simple

payment execution, showing the means to expand donation through the mobile simple payment system. Nonetheless, the study has the following research limitations; First, the mobile simple payment system subjects were limited to the donors of the KRC membership fees. Specifically, those aged 60 and over were the majority in terms of fee donors, so the system execution result is limited. A further study needs to draw a system operation result considering each generation's weight and accessibility. Second, this study has a limitation in the generalization that may represent each country's Red Cross and donation-related institutions. A further study examining differences in the e-payment system operations is needed according to comparative case analyses of various countries' red cross and e-payment systems, donation, and donation type.

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